

oblong with the sides slightly convex and the corners somewhat rounded, also slightly wider distad.

First legs of male enlarged in the usual degree but longer than usual. The penult article exceptionally long, becoming distally much more slender than the preceding article.

Anterior division of the first gonopods conspicuously clavate; the broad distal end bent caudad, the caudal edge setiegerous; posterior division much longer than the anterior, its base broad but above this narrowing rather abruptly to a blade which curves ventromesad nearly to the middle line, with the posterior angle of the tip extended caudad in a short, slender and very acute process.

The posterior gonopods are broad plates each of which curves first cephaloventrad and then ventrocaudad, the distal portion of the blade narrower but still conspicuously broader than usual, the blade with its broad surface subvertical; the distal end characteristically bifid, the two lobes or teeth short.

The types are broken and as a result the number of segments cannot be accurately determined.

Two broken males form the basis of the description.

In the character of the anterior gonopods this species suggests *P. zakiwanus* Chamberlin, known from New Mexico, but the posterior gonopods are conspicuously different.

THE PUPA OF *BOREUS BRUMALIS* FITCH.

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In the August number of *PSYCHE* Dohanian describes and figures *Boreus brumalis*¹ and states that the life-history has not been fully worked out in any species of the genus. The order to which this insect belongs, the Panorpatae, comprises a small group of neuropteroid forms, among which are the genera *Panorpa*, commonly known as scorpion-flies, *Bittacus* and *Merope*, and whose mouth-parts are borne at the end of a snout-like extension of the

¹ Notes on the External Anatomy of *Boreus brumalis* Fitch, *PSYCHE*, XXII, pp. 120-123, pl. IX, 1915.

head, or rostrum. In general, their life-history is imperfectly known, but the larvæ are said to be terrestrial and carnivorous.

On October 4, 1915, I had the good fortune to unearth a number of *Boreus* pupæ at Andover, Mass., some fifteen miles north of Boston. Others were found in this locality up to October 22, and in two separate localities at Melrose Highlands, the first pupa being taken October 6 and the last on November 23. All were found in neat and rather elongate earthen cells in or just beneath the fine root-work of green moss which was growing at the base of trees, chiefly oaks. At the base of one tree I soon found over a dozen. The pupal cells were vertical or inclined and extended to within one half of an inch or so of the surface of the soil. No pupæ could be found under moss other than that which grew at the base of trees.

The pupa is of the same general shape and size (3.2–3.75 mm.) as the adult. The appendages are free. The mandibles are rather large and 4-dentate and vary somewhat in my three specimens (1♂ and 2♀). The male has two pairs of long, narrow wingcases and the female a single short pair. The male genitalia are terminal and somewhat reflexed and in well advanced pupæ exhibit a stout up-turned pair of chitinous clasping organs which are strongly toothed on their concave border. In the

female the abdomen terminates in a more or less conical point, which encloses the inner portion of the ovipositor, while the outer blades of the ovipositor are ensheathed in a pair of ventrally appressed appendages that arise from the eighth abdominal segment and do not quite extend to the end of the body. The coxæ are long and

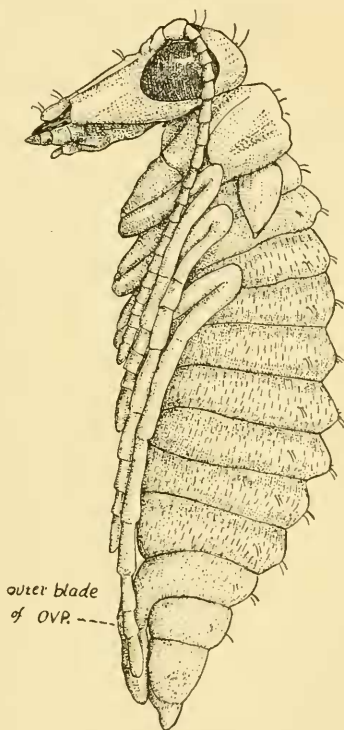


Fig. 1. *Boreus brumalis*, pupa.

stout and probably assist the adult in leaping. There are a few rather long bristles, as shown in the figure, and a short transverse row of little thorns on either side of the mid-dorsal line on abdominal segments 2-5. Under good magnification the surface of the body is finely pointed-granulate. The pupa is at first whitish; but even in the first specimens secured the eyes and mandibles had become quite dark. In well matured examples the body was brownish or greenish yellow and the longer appendages, at first rather closely appressed to the body, showed a tendency to move out of position.

The pupa is easily disturbed and is then decidedly active. The head is moved up and down in a vigorous manner, the mandibles open and shut and the abdomen is twisted around. These movements parallel rather closely those made by the pupa of the Eriocranid moths (*Jugatae*) in working their way to the surface of the soil, and it is possible that the movements of the *Boreus* pupa serve the same purpose. Busck and Böving¹ say the following concerning this Eriocranid pupa, p. 155-6: "While all the other appendages are loose, not glued together as is normal in a Lepidopterous pupa, it is mainly the head and the mandibles and abdominal segments, which are movable and utilized in locomotion, when the pupa digs up through the earth." In *Boreus* the pupal mandibles are about as long as two thirds the distance from their base to the lower portion of the eyes, 4-dentate and several times the size of the small 2-dentate mandibles of the adult insect.

Unfortunately almost all my pupæ were destroyed by a fungus, so that I was unable to rear more than a single *brumalis*. Towards the end of November, the pupæ had become very scarce, though what I took to be deserted open pupal chambers were not uncommon locally. With diligent search, however, I managed to find a single, well advanced pupa on November 22, and this, seven or eight hours later, disclosed a fully or nearly fully pigmented and active male *brumalis*. This insect lived for fifteen days confined in a jelly tumbler half-filled with damp moss. It always kept to the higher places and walked about in leisurely fashion, its metallic blackish head glistening in the light. It contrived to escape once, when it traveled by well-directed six-inch hops.

¹ On *Mnemonica auricyanae* Walshingham, Proc. Ent. Soc., Wash., XVI, pp. 151-162, pl. IX-XVI, 1914.

I was unable to find any adults where I had secured the pupæ, though conditions seemed favorable for their presence. The life of the imago must be rather long, however, as it appears to have a somewhat protracted season. So, too, the larval period seems to be rather extended.

It is to be hoped that inasmuch as this curious winter insect is largely confined to the base of trees and is at times not uncommon, the complete life-history may soon be worked out.

A NEMATODE PARASITE OF ROOT APHIDS.¹

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Parasites of root-infesting plant lice are so rarely encountered that this record of a nematode attacking a root aphid is especially interesting. We first found apterous viviparous and oviparous individuals of a new species of *Anacia* infested with nematodes at

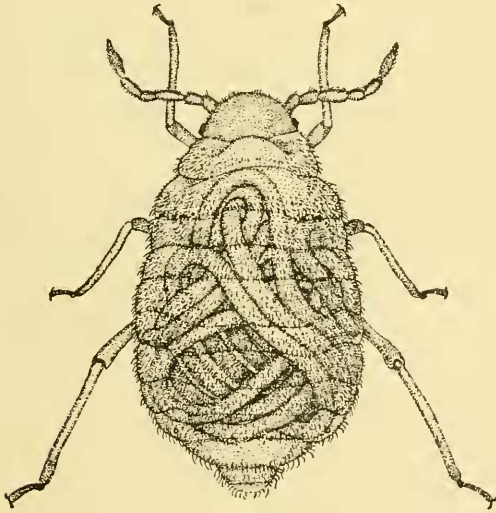


Fig. 1. *Anacia* sp. infested with a Nematode.

Lafayette, Ind., October 16, 1911, and again on October 19, and, although a number of collections were made at frequent dates

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